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ENTERIC FEVER.

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REPORT OF THE MEDICAL OFFICER OF HEALTH, SUBMITTING A REPORT BY DR. DITTMAR ON THE DISTRIBUTION OF ENTERIC FEVER IN THE EASTERN DISTRICT OF GLASGOW IN 1897-1901.

(Presented to the Committee on Health, 28th January, 1903, and ordered to be printed.)

29 MAY 1929

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(p.)
1903

GLASGOW:
PRINTED BY ROBERT ANDERSON, 142 WEST NILE STREET.
1903.

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(p.)
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In submitting Dr. Dittmar's Report on the Distribution of Enteric Fever in Certain Districts of the City during the years 1897-1901, a few words may serve to indicate the general contrast presented by the movement of the death-rate from the disease in these years when compared with those which preceded it.

It has elsewhere* been shown that in 13 of the old Sanitary Districts a higher death-rate from enteric fever obtained during 1891-1900 than in the preceding decade; and, if we state the *average annual rate per million for the whole City* for each quinquennium during those 20 years, we find the following fluctuations:—

1881-5 = 325
1886-90 = 185
1891-5 = 198
1896-1900 = 242

A reference to the figures for individual years shows that the decrease indicated in the average annual rate for 1886-90 began quite suddenly in 1885. But the level of diminished prevalence which was reached in the following quinquennium has not been maintained, and the fourth period, even more than the third, shows the extent of the recoil.

It might, of course, be assumed that the higher death-rate in the last two periods could be explained by a greater fatality in individual attacks, without necessarily implying an increased prevalence of the disease. But within the last decade we can compare both the attack-rate and the death-rate, and, on the basis of the information obtained through the Notification Act and from the registered deaths, the following diagram has been constructed. It shows the attack-rate and the death-rate for each year 1891-1902, and also the annual rainfall in inches.

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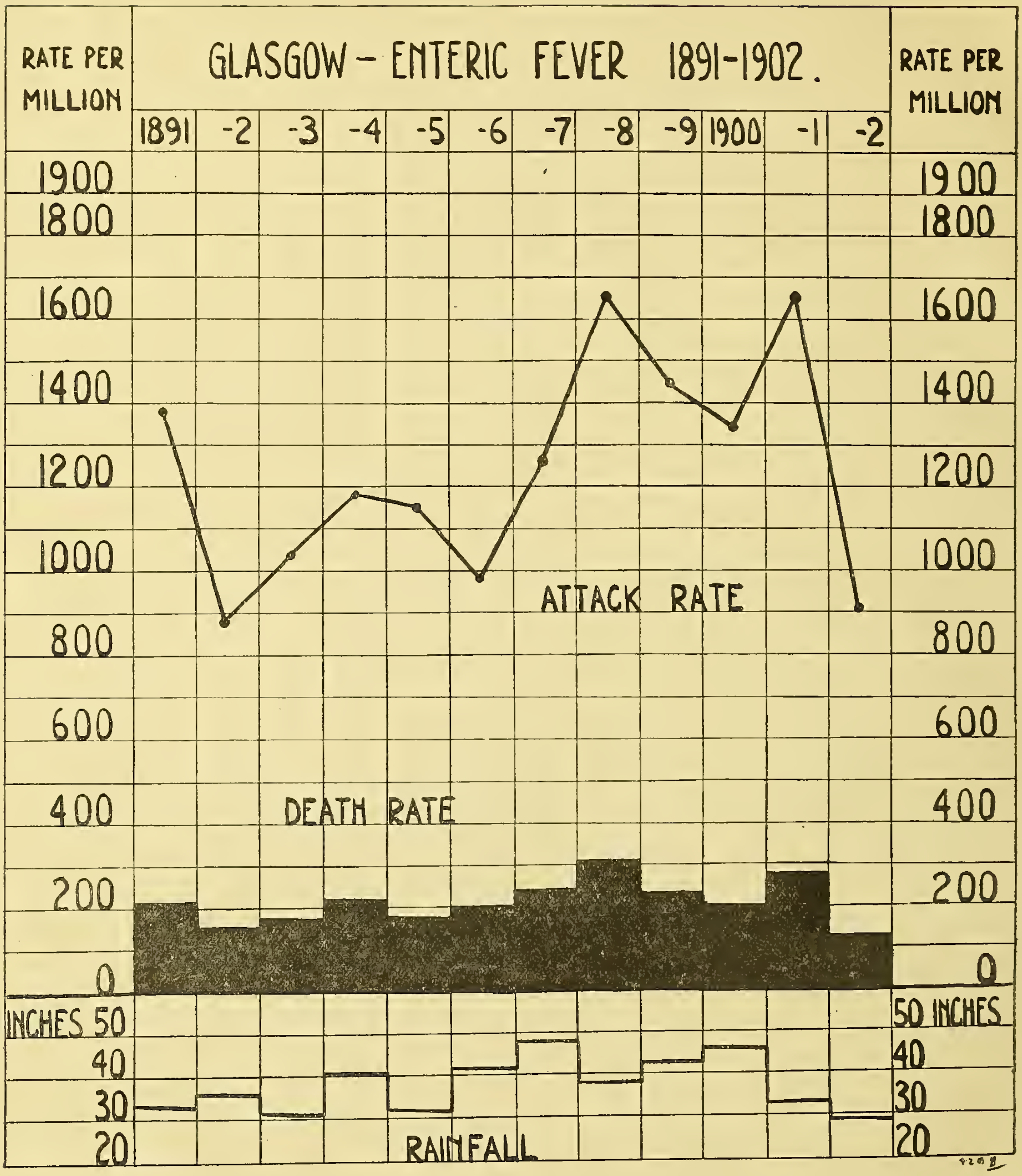
* Annual Report of Medical Officer, 1901, p. 44.



The curve here represents the cases and the columns the deaths occurring *per thousand* of the population of the City, as estimated from the number of inhabited houses.

The curve, even more graphically than the columns, indicates the greater prevalence of the disease in the later years of this period, and we know that the proportion of this which could be assigned to distinctly epidemic influences was comparatively small. But, apart from epidemic influences, we may consider what are the general and what the local conditions on which a high-level prevalance of enteric fever depends. General causes will exert themselves over a wide area, and we consequently look to the experience of other towns to support or disprove the suggestion of their operation. Has the increased prevalence of late years in Glasgow been peculiar to it? The Registrar-General classifies towns with a population exceeding 25,000 as Principal Towns, and a comparison of the death-rates from enteric fever in them during the years contained in the preceding chart is instructive. On tabulating these rates, we find that the towns fall into two groups, which are geographically distinct. The towns in the West of Scotland show, not only a greater relative, but an increasing, prevalence in the latter half of the decade compared with the towns in the East. Perth is the only exception, and here the high average in 1897-1901 is due wholly to an exceptional prevalence in 1897. The following Table is constructed from the rates given by the Registrar-General:—

AVERAGE ANNUAL DEATH-RATE PER 100,000 FROM ENTERIC FEVER IN THE PRINCIPAL TOWNS OF SCOTLAND IN 1891-6 AND 1897-1901.

	1891-6.	1897-1901.		1891-6.	1897-1901.
Glasgow,	20	25	† Perth, ...	17	34
* † Govan and Partick,	6	25	Dundee,	17	9
Paisley,	22	37	Leith, ...	14	8
Greenock,	12	20	Aberdeen,	9·3	9·8
† Kilmarnock,	64	119	Edinburgh,	15·5	11·4
* † Coatbridge,	39	42			

* Rates for 1891 not included.
† Rates for 1901 not included.

It would entail a much wider survey than is here intended to consider why this increase should be limited to the West of Scotland towns.* There is a suggestion in the chart that an increasing prevalence of the disease is associated with years of increased rainfall. But the relationship is not simple, and would appear to be influenced by the prevailing temperature, especially in the second and third quarters of the year. It is many years since Buhl applied to enteric fever Pettenkoffer's observations on the relationship between the level of the ground water and the incidence of cholera, but, as the late Sir George Buchanan suggested, this association might be explained more simply by direct pollution of drinking water when this was obtained from surface wells.

Confining the present observations to the information contained in the chart, it will be observed that, while in the years 1891-6 the average annual fall was 36·1 inches, during 1897-1901 it was 41·8 inches; and that the wettest years, 1897 and 1900, were each followed by one of exceptional prevalence of enteric fever. But if the prevalence follows rather than coincides with the rainfall in any given year, it should be related, not to the amount of rain which falls throughout that year, but to the quantity which falls in the early months, and this to some extent is what has occurred.

The increased rainfall during the years 1897-1901 arose almost wholly from an excess falling in the first half, but especially in the second quarter of each year.

AVERAGE QUARTERLY RAINFALL IN INCHES.

	First.	Second.	Third.	Fourth.	Average Annual.	Proportion of Total Cases per year occurring in 3rd and 4th Quarters.
1891-6, ...	7·9	6·1	10·5	11·4	36·1	60 per cent.
1897-1901, ...	8·7	10·2	10·3	11·4	41·8	66 per cent.

In the last column here, the years with much rain in the spring months are associated with an increased autumn prevalence of the disease, so that the cases occurring in the third and fourth quarters come to form 66 per cent. of the total yearly number, compared with 60 per cent. only when the early months have been drier. And if we apply the suggestion that wet springs tend to produce a high-level prevalence of the disease in autumn, a fair degree of correspondence can be shown to exist between the enteric death-rate of a particular year and the amount of rain falling in the first six months, *when this does not fall much below the average of adjacent years.*

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* From rates kindly supplied me by the County Medical Officers of Lanark, Renfrew, Stirling, Dumbarton, and Ayrshire, the increase has not been shared by the County Districts, save to a limited extent in the Upper Ward of Lanarkshire.

PERIOD 1891-6.—AVERAGE RAINFALL, JANUARY-JUNE, 14 INCHES.

	Rainfall, January-June. Inches.	Annual Death-rate, Enteric Fever. Per Million.
1894,	24	221
1896,	16	206
1892,	13	151
1893,	11	178
1895,	7	176

	Rainfall.	Death-rate.
1891,	10	218

PERIOD 1897-1901.—AVERAGE RAINFALL, JANUARY-JUNE, 19 INCHES.

	Rainfall, January-June.	Annual Death-rate, Enteric Fever.
1897,	26	243
1899,	22	238
1900,	16	209

	Rainfall.	Death-rate.
1898,	15	312
1901,	13	275

In both periods the correspondence between a high-level prevalence of the disease and a considerable rainfall during the first six months is fairly complete, the exceptions occur in the years of relatively dry springs. In two of these, 1898 and 1901, the highest rates of the series are reached.* But each followed a year of exceptionally heavy rainfall, and they have, in common with 1893 and 1895, this circumstance, that during the second and third quarters of each the mean temperature of the air was higher than in any other year of the series.

Temperature and rainfall, however, are not direct causes. They aid or restrain growth when the local conditions otherwise are suitable for organic life. Enteric fever is a soil infection, and this, for practical purposes, is equivalent to surface impurity. It is with this phase of the subject that Dr. Dittmar's Report chiefly deals.

Almost at the beginning of this enquiry, Dr. Dittmar found that he had to distinguish between cases occurring among the members of already infected households, and to be explained by personal contact with the sick, and a further number of subsequent sickenings among persons who were not within this circle of infection.

There being no evidence forthcoming by which these later sickenings could be explained by re-invasion from outside sources, it became necessary that he should consider the physical circumstances generally on which perpetuation of infection might depend, and from which, by hypothesis, a recurrence of the disease might arise. So that, beginning his enquiry within the circle of direct exposure which the sick person established for his own household, he pursued it on the lines along which infection might radiate, until it reached these cases which had no direct contact with the first patient at all, but only with the conditions which the person sick of enteric fever can create beyond the circle of his immediate surroundings. Having applied this method to a consideration of the associated cases of a particular year, he finds it still serviceable in explaining recurrences in those following, and incidentally finds also his suggestion supported by the relatively greater incidence of the disease in females, this being contrary to the usual experience that males are more liable to attack.

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* 1891 also is a notable exception, but both area and population are slightly different here.

The comparative ease with which the infection of enteric fever can be controlled, when scrupulous care is bestowed on the person and surroundings of the sick, is, to a large extent, responsible for the prevailing tendency to underrate its infectivity. In two directions Dr. Dittmar's enquiry may help to correct this impression. In his analysis the term "secondary infection" is restricted to cases occurring in the infected household within the accepted limit of the period of incubation, and he finds that the proportion of these is least in one-apartment houses. This, as he points out, is most obviously related to the almost uniform practice of removing cases in these circumstances to hospital. But, leaving those which may be regarded as direct infections, he found that, in 71 tenements in which the disease recurred, after the period of incubation had passed, this recurrence took place in 12 families living on the same floor as the formerly infected house, and in 47 families living on different floors of these tenements. And, in considering the incidence of these with reference to the methods of excrement disposal, his enquiry repeats the experience which has directed the policy of the Committee on Health in this respect for years. Recrudescence of the disease occurred in 23 per cent. of the invaded tenements which were dependent on dry or conservancy methods of dealing with excreta; in 6 per cent. only of those supplied with water-closets. Regarding the former class, the policy is already formulated, and only requires to be persistently followed. Every midden is a potential centre for the spread of enteric fever, and the more recent knowledge that infection may be voided in the urine serves to emphasise the unsuitability of these structures for town populations. In the process of emptying it is impossible to avoid surface pollution, and disinfection of the surrounding area is rarely practicable.

On the other hand, the association of a small proportion (6 per cent.) of recurrent cases with properly constructed water-closets suggests the lack of a right appreciation of the uses to which these fittings may be put, and illustrations are still too frequent in many districts of their abuse.

Apart from the repression of this habit, the enquiry further points to an extended application of the processes of disinfection.

A. K. CHALMERS, M.D.,
Medical Officer of Health.

Sanitary Chambers,
Glasgow, *January*, 1903.

GLASGOW RAINFALL IN INCHES IN EACH QUARTER FROM 1890-1902.

YEAR.	QUARTER.				YEAR.
	First.	Second.	Third.	Fourth.	
1890	8·97	7·81	11·39	9·56	37·73
1891	6·52	3·58	10·04	13·18	33·32
1892	5·75	7·80	13·32	9·25	36·12
1893	5·67	6·10	8·95	10·56	31·28
1894	17·21	7·31	7·85	9·34	41·71
1895	3·75	4·06	10·57	13·68	32·06
1896	8·67	7·96	12·83	12·86	42·32
1897	9·70	17·08	11·00	10·29	47·07
1898	8·28	7·71	10·74	11·32	38·05
1899	12·00	10·48	9·01	11·71	43·20
1900	7·85	8·54	11·83	18·64	46·86
1901	6·05	7·45	9·08	10·44	33·02
1902	6·73	4·87	8·40	9·05	29·05

GLASGOW MEAN TEMPERATURE OF EACH QUARTER OF THE YEAR AND OF EACH YEAR FROM 1890-1902.

YEAR.	QUARTER.				YEAR.
	First.	Second.	Third.	Fourth.	
1890	41·4°	51·1°	57·2°	42·3°	48·0°
1891	39·2°	49·7°	57·8°	43·0°	47·4°
1892	37·7°	50·2°	55·5°	40·7°	46·0°
1893	41·0°	54·6°	58·0°	43·7°	49·3°
1894	41·4°	50·7°	56·5°	44·9°	48·4°
1895	34·5°	53·3°	58·3°	42·2°	47·1°
1896	42·5°	50·9°	56·8°	41·5°	47·9°
1897	39·6°	49·7°	57·6°	44·7°	47·9°
1898	39·7°	51·7°	57·2°	42·8°	47·8°
1899	39·0°	49·7°	57·1°	43·9°	47·4°
1900	37·1°	50·6°	56·1°	44·6°	47·1°
1901	38·4°	50·6°	58·0°	42·3°	47·4°
1902	38·9°	48·0°	54·2°	46·0°	46·8°

REPORT BY DR. DITTMAR OF AN ENQUIRY INTO THE INCIDENCE OF ENTERIC FEVER IN THE EASTERN DISTRICT DURING THE YEARS 1897-1901.

This investigation was undertaken by me at Dr. Chalmers' suggestion, in order to ascertain what connection might demonstrably exist between cases of enteric fever which in point of residence had a local association. The Eastern District was chosen partly from its considerable size in point of population, and also because it afforded an opportunity of contrasting the behaviour of the disease in houses supplied with water-closets with those where middens still existed.

Included in the district are the sanitary sub-divisions, numbered 5, 7, and 8, viz.:—Bellgrove and Dennistoun, Greenhead and London Road, and Barrowfield. Dennistoun is a residential suburb; the others are working-class districts, and contain many large engineering establishments and factories. The population in 1901 was 173,104, which is somewhat less than one-fourth of the total population of the City, while the density per acre was 60 in Bellgrove and Dennistoun, 74 in Greenhead and London Road, and 225 in Barrowfield.

The number of cases occurring in each year is given in the following short Table, which also records the number of * "houses" and of "tenements" affected:—

Year.	No. of Cases of Enteric.	No. of Houses affected.	No. of Tenements affected.	Cases per House.
1897,	177	151	140	1·17
1898,	288	249	221	1·16
1899,	400	346	294	1·16
1900,	191	170	160	1·12
1901,	260	219	209	1·18

This gives, for the five years, 1,316 cases of enteric fever, distributed among 1,135 houses in 1,024 tenements.

"RECRUDESCENCE" OF ENTERIC FEVER IN THE SAME TENEMENT IN SUCCESSIVE YEARS.

On investigating the question of the "recrudescence" of the disease in the same tenement in successive years, we find that—

18	of the Tenements	affected in	1897	were again	affected in	1898,	or 12·8	per cent.
19	”	”	1898	”	”	1899	” 8·6	”
22	”	”	1899	”	”	1900	” 7·5	”
12	”	”	1900	”	”	1901	” 7·5	”

This gives an average tenement recrudescence of 8·7 per cent.

Two tenements in widely separated portions of the district had cases of enteric fever in them for three successive years, both having in common that they were provided with open pan privies and "wet" middens.

The reappearance of enteric fever in the same tenement in successive years I call a "recrudescence," irrespective of the number of cases of the disease.

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* By "house" is here meant the apartment or apartments occupied by one household; and by "tenement" a group of houses, distinguished by *one* number in the street, and corresponding to the Scotch use of the word "land." Occasionally a side or back tenement is also included, because where water-closets have not been introduced the privy is usually common to all the houses. The majority are four storeys high.

On analysing these "recrudescences" we find that some occurred in the same house, others in different houses on the same floor as the original case, others again on different floors of the same tenement.

Of the	18	in	1898, 3	were in same house,	3	on same floor, and	12	on different floors.	
,,	19	,,	1899, 5	,, ,,	1	,, ,,	13	,,	,,
,,	22	,,	1900, 3	,, ,,	5	,, ,,	14	,,	,,
,,	12	,,	1901, 1	,, ,,	3	,, ,,	8	,,	,,
	71		12		12		47		

When the disease reappears in the same house in the following year, "recrudescence" is sometimes not the proper word to use, as it is only the accidental occurrence of the case at the beginning of the year which leads to the tenement being marked as one in which "recrudescence" occurred.

But cases of this kind were only two in number, and took place 3 and 4 weeks after the last case in the respective families. The others could be truly called "recrudescences," and occurred from 4½ to 12, and in one instance *15*, months after the last case in the house.

Of the "recrudescences" in different houses on the same floor, one took place 14 weeks after a case in a neighbour's house; the others occurred at intervals of 9 to *22* months after a case on the same floor.

The "recrudescences" distributed among houses on different floors of a tenement occurred mainly 6 to 12 months after a case, sometimes as long as 15, 18, and even *22* months later.

In the absence of any evidence against milk or other methods of reinfection, the "recrudescence" of enteric fever, even after so long an interval as 18 to 22 months, is assumed to show evidence of infection lying latent in the place affected.

"RECRUDESCENCE" IN HOUSES OF VARIOUS SIZES.

During the five years under consideration, the cases of enteric fever had the following distribution in houses of several sizes:—

Size of House.	No. Invaded.	No. of Cases.	Case Rate per House.
1 apartment, ...	277	319	1·15
2 apartments, ...	665	771	1·15
3 ,, ...	153	180	1·17
4 ,, and upwards, ...	40	46	1·15
	1,135	1,316	

The case rate per house of each size is practically the same, though the numbers in the "four-apartment and upward" houses are rather small to draw reliable conclusions from.

But, if we calculate the average number of cases of enteric during the five years in each class of house per 1,000 living in that class in 1901, we get the following result:—

AVERAGE NUMBER OF ATTACKS OF ENTERIC FEVER PER 1,000 OCCUPANTS IN HOUSES OF—

1 Apartment.	2 Apartments.	3 Apartments.	4 Apartments and upwards.
1·84	1·6	1·2	0·76

In other words, we find that what holds good for death-rates in other diseases holds good for the incidence of enteric fever. There is a larger proportion of the disease in the smaller houses, and the proportion gradually diminishes as the size of the house increases.

INFECTIVITY OF ENTERIC FEVER IN RELATION TO OCCURRENCE OF SECONDARY CASES.

A point of considerable importance to the epidemiologist is the infectivity of enteric fever, and there is among the cases under consideration a fair amount of evidence of this. It is a quality of enteric fever which is to a great extent disregarded.

"SECONDARY" CASES IN THE SAME HOUSE.

This leads us to enquire how many "secondary" cases arose in the infected houses. By "secondary" cases in the same household are here meant cases sickening 10 or more days after the first one. It is not possible to obtain the exact number of these, as the dates of sickening could not always be ascertained; but, as the greater proportion could, the results may be looked upon as in the main accurate.

There is recorded in the following tabular form—(1) the percentage of each class of house in which secondary cases arose; (2) the average number of days between primary and secondary sickenings in each class of house; and (3) the percentage of secondary cases in each class of house.

(1) PERCENTAGE NUMBER OF HOUSES OF EACH CLASS HAVING SECONDARY CASES

1 Apartment.	2 Apartments.	3 Apartments.	4 Apartments and upwards.
4·7 per cent.	6·7 per cent.	5·8 per cent.	5 per cent.

Here we have the first indication that secondary cases occur more frequently in the larger houses, and, as we shall see later, this is still more marked when we consider the percentage number of secondary cases in each class of house.

(2) AVERAGE NUMBER OF DAYS ELAPSING BETWEEN PRIMARY AND SECONDARY SICKENINGS IN THE VARIOUS SIZES OF HOUSES.

1 Apartment.	2 Apartments.	3 Apartments.	4 Apartments and upwards.
21 days.	27 days.	33·3 days.	6½ months.

It is interesting to observe that, as the house increases in size, the interval between primary and secondary sickenings increases. The possibility of isolation becomes greater as the house increases in size, but in a certain proportion of cases it ultimately breaks down.

It must be added that, in three houses of two apartments, secondary sickenings occurred 4¾, 6½, and 9 months after the first; and that in three houses of three apartments, in which eight secondary cases arose, the original patient had been kept at home during the whole illness in two of them, and for 30 days in the third one.

In two houses of four apartments and upwards, where secondary cases occurred, the patients were removed to hospital in one, while they remained at home in the other case.

(3) PERCENTAGE NUMBER OF SECONDARY CASES IN EACH CLASS OF HOUSE.

1 Apartment.	2 Apartments.	3 Apartments.	4 Apartments and upwards.
6·2 per cent.	7·9 per cent.	8·3 per cent.	6·5 per cent.

This gave us 125 "secondary" cases, according to the dates of sickening available. In my opinion, however, founded on personal knowledge of the class of people affected, as well as of the dates at which successive cases were removed to hospital, the probable number of secondary cases is larger than this—more likely numbering from 180 to 200.

This analysis shows that the percentage of secondary cases increases till we get to houses of four apartments and upwards. It has to be borne in mind, however, that the number of patients in the last class of house was small (46 in five years); but isolation can certainly be more nearly perfect in the larger house, and the intelligence of the people is probably, while their power of obtaining skilled guidance in the way of medical attention, is certainly, greater.

All cases of enteric are removed to hospital from single-apartment houses, and nearly all from two-apartment houses, while patients are frequently left at home in houses of three apartments and upwards. This circumstance probably accounts in a large measure for the larger percentage of secondary cases in two and three-apartment houses.

Enteric in Water-Closet and in Privy Tenements.

In comparing the behaviour of enteric fever in tenements provided with water-closets and in those provided with open pan privies and middens, some "wet" to begin with, and all ultimately "wet" from misuse, a difference in "recrudescence" is to be observed.

The great majority of the tenements under discussion are provided with water-closet facilities, the water-closets being built in "stacks" at the back of each tenement, one on each floor usually serving the requirements of three or four households.

It is interesting to compare the degree of "recrudescence" in each class of tenement.

The following Table in parallel columns gives the results of this comparison:—

Number of Cases of Enteric Fever in "Privy" Tenements in each of the 5 Years under consideration.	Number of Cases of Enteric Fever in Water-closet Tenements in each of the 5 Years under consideration.
In 1897 there were 17 cases in 7 t'ments.	In 1897 there were 160 cases in 133 t'ments.
In 1898 ,, 44 ,, 14 ,,	In 1898 ,, 244 ,, 207 ,,
In 1899 ,, 50 ,, 23 ,,	In 1899 ,, 350 ,, 271 ,,
In 1900 ,, 3 ,, 1 ,,	In 1900 ,, 188 ,, 159 ,,
In 1901 ,, 11 ,, 3 ,,	In 1901 ,, 249 ,, 206 ,,
Case rate per tenement, ... 2·6	Case rate per tenement, ... 1·2
Percentage.	Percentage.
Secondary cases in same house, 35	Secondary cases in same house, 61·6
,, ,, different house, 64·7	,, ,, different house, 38·4
Recrudescence, ... 23	Recrudescence, ... 6·1

One privy and midden usually serve a number of houses, and, in the absence of demonstrable infection from other sources, it is assumed that the infective material in the midden spreads infection by means of natural agencies, *e.g.*, the wind, flies, surface pollution, &c.

The numbers dealt with are small, especially those in connection with "privy" tenements, but they would seem to point to the following conclusions:—

(1) That enteric infection tends to cling to a place, "recrudescence" occurring more often in "privy" tenements, where the soil pollution is relatively greater, than in water-closet tenements.

(2) That in the case of "privy" tenements the disease shows a greater tendency to invade neighbouring houses than in the case of water-closet tenements.

In the year 1898 the attack-rate of the disease for the City reached a high level, but in 1899 the number of cases occurring in the Eastern District exceeded that of any of the years under review. In that year there were 50 cases in Camlachie, in two groups, one on either side of Great Eastern Road,—where one is forced to the conclusion that open privies and "wet" middens were important factors in the spread of the infection.

The affected groups of tenements are almost opposite one another, those on the north being a little further east (in Coalhill Street and Society Street, which are close to and parallel to one another, and in East Union Street, a small street which runs from Society Street parallel to Great Eastern Road), those to the south lying behind Camlachie Police Station.

Besides proximity to one another, the houses have in common the generality that they are old, although many are in good repair.

Some are one-storied cottages, though the majority are of two storeys, and all are inhabited by the unskilled labouring class.

Another quality they have in common is the possession of pan privies and middens, one in Great Eastern Road "wet" to begin with, and all "wet" ultimately from the manner in which they are used.

There is ample air space both in front of and behind the houses; the "back courts" are mainly of earth, though in some there are cobble stones, and their usual state in wet weather is very muddy.

Before describing the outbreak in more detail, it is necessary to state that water and milk infection were both excluded as probable sources of infection. The water supply is from the main; the milk supply as follows:—There are two dairies, "A" and "B," in the district from which the people derived their milk.

The owner of Dairy "A" supplied milk from his own cows only, which were kept in his town byre.

The owner of Dairy "B" supplied milk which he obtained from farms in the country.

Both had about an equal number of customers among the affected houses, the owner of Dairy "A" having supplied 26 of the patients with milk in whole or in part, the owner of Dairy "B" having supplied 21 in whole or in part.

5 of the cases supplied from Dairy "A" sickened between 29/6/99 and 12/7/99
8 „ „ „ "A" „ „ 13/7/99 and 19/7/99

or 13 out of 26 cases supplied from Dairy "A" sickened within three weeks.

5 of the cases supplied from Dairy "B" sickened between 28/6/99 and 12/7/99
8 „ „ „ "B" „ „ 13/7/99 and 19/7/99

or 13 out of 21 cases supplied from Dairy "B" sickened in the same three weeks.

Eleven sickened between 17th July, 1899 and 19th July, 1899 (inclusive), of whom there were 2 who had milk from Dairy "A" alone, 5 from "B" alone, 1 from "A" and "B," 1 who only had "condensed" milk, and 2 who had milk from Dairy "B" along with condensed milk. This was some time after the disease had presumably obtained a hold on the locality.

The owners of Dairies "A" and "B" had no enteric in their own households, nor did the disease exist among any of their employees. They also supplied a large number of people in the East-end, outside of the small area under discussion, and *there was no similar prevalence of enteric fever among their other customers.* Inquiries made at the time with regard to the presence of enteric fever at any of the farms in the country which supplied Dairy "B" were answered in the negative.

Lastly, it has to be borne in mind that the people belong to the poorest class, and that they are not great milk drinkers. It has to be noted, too, that most of the cases occurred in females above 10 years of age (16 being above 15), who are tea drinkers, and who would only add a drop or two of milk to the hot tea.

It is quite a mistake to suppose that people of this class eat porridge, which would mean a fair quantity of milk. Unfortunately, in towns at least, porridge does not enter largely into the diet of the poorest working class.

One is therefore forced to the conclusion that the surroundings of the people, together with the surface pollution which is unavoidable where "wet" middens exist, were the main factors in the spread of the disease once it had been implanted. Probably one or more unrecognised and unrecorded cases of enteric fever were the source from which all the rest sprang.

In one of the "privy" tenements affected in Great Eastern Road, there had been three cases of the disease during the autumn of 1898; in East Union Street there had been a case in 1898 in connection with a "privy" tenement; and in the autumn of 1897 there had been a case in connection with a "privy" tenement in Coalhill Street. Opportunity of "soil" infection therefore existed.

Analysis in detail of the above cases gives the following results:—10 cases occurred in 9 houses in 13 to 41 Coalhill Street, the dates of sickening having been between 29th June, 1899, and about 20th September, 1899. The youngest person attacked in this group of cases was 11 years old. The people living in the 9 houses affected consisted of 6 below and 34 above 10 years, and 9 of the cases were in females over 10 years. 13 to 37 Coalhill Street form three sides of a large space, or earth courtyard, in which there are supplied one large ashpit and two pan privies.

Nineteen cases occurred in close proximity to these—4 on the opposite side of Coalhill Street, in water-closet tenements; 12 in Society Street (a short street running parallel to Coalhill Street), of which 10 were in water-closet tenements (in 6 houses); and two in "privy" tenements (in 2 houses); while 3 occurred in East Union Street, in 2 houses in 1 "privy" tenement.

The population in the affected houses consisted of 29 below and 35 above 11 years, and 7 of the cases were below and 12 above 10 years, of whom 8 were females.

Cases to South of Great Eastern Road.

The group of tenements in Great Eastern Road, Yate Street, and Porter Street form an irregular space bounded on the south-west by the railway line, and, though there is no proper "court" to any of them, there is a large, uneven, and irregular space behind and around them, not covered with asphalte anywhere, but formed solely of earth.

There are about 60 individual houses here of one and two apartments (mainly one apartment), and for the people inhabiting these there are provided one "wet" midden, in addition to two pan privies, separated by a partition from the ashpit.

Sixteen cases sickened here between 28th June, 1899, and 22nd September, 1899. Five cases occurred in "privy" tenements in East Hope Street, which is immediately opposite Coalhill Street, the infection having been imported there by the baby of a woman who had contracted the disease in Coalhill Street, and had sent her child to friends there when she was removed to hospital. They sickened between an indefinite date about the end of July and 22nd September, 1899. In all there were 50 cases of enteric fever, 18 below and 32 above 10 years of age, and of the latter 25 were females. As already stated, 16 of the 25 were over 15. The incidence of the disease does not suggest milk as the source. It would appear to suggest that those who were most at home, and presumably most exposed to infection, took the disease, while the men who were at work all day, and the young children who were at school for part of the day, being relatively less exposed, escaped.

Under such circumstances, I believe, therefore, that the assumption is warranted that the methods of conservancy within this area were important factors in the spread of enteric fever during the autumn of 1899.

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